e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(11); 270-275

Original Research Article

Clinico-Epidemiologic and Early Outcome Assessment in Traumatic Spine Injuries: An Observational Study.

Saurabh Kumar

Assistant Professor, Department of Orthopaedics, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, India

Received: 11-05-2023 Revised: 23-06-2023 / Accepted: 18-07-2023
Corresponding author: Dr. Saurabh Kumar
Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to assess the epidemiology, clinical features and early outcome in traumatic spine injuries at a tertiary hospital in Bihar region.

Material & methods: The present study was single-center, prospective, observational study, conducted in Department of Orthopedics for the period of 2 years. 100 patients were included in the study.

Results: Out of 100 patients, most of the patients were in the age group 51-60 (32%) and 41-50 (30%). Mean age was 51.59 years. Majority of the patients were male 70% while 30% patients were female. In present study, majority of traumatic spine injuries were due to road traffic accidents (52%), followed by fall from height (45%) and assault (3%). Majority of spine fractures occurred at cervical (40%) followed by Lumbar (30%) followed by thoracic (20%) vertebral level. Out of 100 patients, 55 patients (55%) had no associated injuries. Common associated injuries were hemoperitoneum (12%), head injury (11%), fracture humerus (9%) and fracture clavicle (6%). Out of 100 patients, 54% patients had no Neurodeficit and 48=6% patients had Neurodeficit. On pre - operative assessment 50% patients had ASIA score of E, 11% had ASIA score of D, 17% had ASIA score of C, 7% had ASIA score of B and 15% had ASIA score of A. Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%.

Conclusion: Complication rates were higher in patients treated non-operatively. Leading causes in deaths at cervical level were due to respiratory failure and leading causes of deaths in thoracic and lumbar vertebral level were due to secondary complications of long-standing bed sores.

Keywords: Traumatic Spine Injury, Road Traffic Accidents, Cervical Vertebral Level, ASIA Score.

Introduction

Traumatic spinal cord injury (TSCI) is a catastrophic event with a high mortality rate and physical and emotional difficulties for patients. [1-3] It is defined as injuries to the spinal cord, nerve roots, osseous structures, and disco-ligamentous components. [4] TSCI can be due to motorcar crashes, falling, violence, and sports. [2] Besides, it can cause a tremendous burden on societies. [5,6] TSCI can cause pain, paralysis, spasticity, sensation loss, urinary, and fecal incontinence and makes patients susceptible to pneumonia, septicemia, urinary tract infections, pressure ulcers, and cardiac dysfunctions. [7,8] Disabilities caused by TSCI can be permanent and not fully treated with medical care offered to patients today; therefore, preventive solutions might be valuable. [9]

Spine patients and their family has to chase mentally, physically and financially challenges for complete treatment of SCI. [10,11] Therefore, factors that contribute to the cause of the injury need to identified and modified to help in adopting the proper prevention strategies and treatment strategies to avoid the spinal cord injury have and disability. In this study we try to understand and manage SCI in the right direction. The management of SCI is controversial. A traumatic cervical spinal fracture (TCSF) is typically caused by severe violence; if this is combined with a dislocation, the risk of CSCI is greatly increased. The mean annual incidence of TCSF is 65 cases per 100,000 hospital admissions; risk factors include an age of 31–45 years, male sex, fall from a height, and traumatic [C5, C6] vertebral fractures. [10]

A traumatic cervical spinal fracture (TCSF) is typically caused by severe violence; if this is combined with a dislocation, the risk of CSCI is greatly increased. The intervertebral discs separate the vertebral bodies and evenly spread the loads among them. These discs degenerate with age and become more susceptible to injury. [11] TCSF/dislocation has received a great deal of attention worldwide. [12-14] However, cervical disc herniation and bulging have not been well-studied. The posterior ligamentous complex includes the intervertebral disc, ligamentum flavum, and interspinous and nuchal ligaments; this complex plays a critical role in cervical spine stability. [15,16] Assessment of neurological deficit is done by ASIA SCORING (American Spinal Injury Association), Sub-axial Cervical Spine Injury Classification System (SLICS) and Thoraco-lumbar injury classification and severity score (TLICS). [17]

Hence the present study was undertaken to study epidemiology, clinical features and early outcome in traumatic spine injuries at a tertiary hospital in Bihar region

Material & Methods

The present study was single-center, prospective, observational study, conducted in Department of Orthopedics Netaji Subhas Medical College and Hospital , Amhara, Bihta, Patna, India for the period of 2 years. 100 patients were included in the study.

Inclusion Criteria:

- All patients with traumatic spine injuries attending OPD or admitted in emergency, willing to participate in study

Exclusion Criteria:

- Non traumatic patients with spine ailments

Methodology

Study was explained to patients/relatives and written informed consent was taken for participation and follow up. All the patients received in emergency room were managed according to ATLS protocol (general examination, primary and secondary surveys to identify associated injuries). Patient was log rolled for examination of the back. Note was made for any bruises, swellings and palpated for kyphotic angulations, step-off and point tenderness which was present in injuries to osteo-ligamentous complex. Radiological imaging (X rays, CT scan, and MRI) were done. After clinical and radiological examination patients further treatment options (operative/non operative) were planned. All patients admitted for surgical intervention would be assessed pre operatively with complete hemogram, renal function tests/liver function tests, blood sugar levels (FBS and PP), PT/PTI/INR, blood grouping, neurological status as per American spinal injury association (ASIA impairment scale), pain –back pain using visual analogue scale (VAS), imaging such as radiographs- cervical and thoracolumbar spine (AP/Lat view)- Vertebral body height, NCCT of affected spine, MRI of affected spine.

After fitness, patients underwent surgery at our center. Standard post-operative care was provided to all patients. Patients were discharged appropriately as per surgery protocol. All patients who reported were followed up in OPD/telephonically after every 4 weeks till 1 year.Patients were studied for: Survivorship, Neurological status, Nutritional status, Complications like bed sores, urinary tract infections, upper respiratory tract infections and Sexual functions. Radiologically patient was reviewed for the deformity.

Statistical Analysis

Data was collected and compiled using Microsoft Excel. The presentation of the Categorical variables was done in the form of number and percentage (%). On the other hand, the presentation of the continuous variables was done as mean ± SD and median values. The comparison of the variables which were qualitative in nature were analyzed using Fisher's Exact test. The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of Statistical Package for Social Sciences (SPSS) software version 21.0. For statistical significance, p value of less than 0.05 was considered as significant.

Results

Table 1: Distribution of age (years) in males and females

Age in years	Male (n=70)	Female (n=30)	Total
≤ 20	1	0	1 (1)
21-30	4	2	6 (6)
31-40	4	3	7 (7)
41-50	22	8	30 (30)
51-60	24	8	32 (32)
61-70	14	6	20 (20)
>70	1	3	4 (4)
Mean ± SD	55.05 ± 11.59	53.27 ± 13.97	51.59 ± 12.38

Out of 100 patients, most of the patients were in the age group 51-60 (32%) and 41-50 (30%). Mean age was 51.59 years. Majority of the patients were male 70% while 30% patients were female.

Table 2: Distribution of mode of injury, injury level and associated injuries of study subjects

Mode of injury	**N**	**%**
RTA	52	52
Fall from height	45	45
Assault	3	3
Injury level		
Cervical	40	40
Cervical and Lumbar	1	1
Cervical and sacral ala	1	1
Cervical and thoracic	5	5
Lumbar	30	30
Lumbar and sacral ala	2	2
Thoracic	20	20
Thoracic and Lumbar	3	3
Associated injuries		
No associated injuries	55	55
Hemoperitoneum	12	12
Head injury	11	11
Fracture humerus	9	9
Fracture clavicle	6	6
Others	7	7

In present study, majority of traumatic spine injuries were due to road traffic accidents (52%), followed by fall from height (45%) and assault (3%). Majority of spine fractures occurred at cervical (40%) followed by Lumbar (30%) followed by thoracic (20%) vertebral level. Out of 100 patients, 55 patients (55%) had no associated injuries. Common associated injuries were hemoperitoneum (12%), head injury (11%), fracture humerus (9%) and fracture clavicle (6%).

Table 3: Distribution of pre -operative assessment of study subjects

Pre-operative assessment	**Frequency**	**Percentage**
Neurological status		
With neurodeficit	46	46
Without neurodeficit	54	54
ASIA score		
A	15	15
B	7	7
C	17	17
D	11	11
E	50	50%

Out of 100 patients, 54% patients had no Neurodeficit and 48=6% patients had Neurodeficit. On pre -operative assessment 50% patients had ASIA score of E, 11% had ASIA score of D, 17% had ASIA score of C, 7% had ASIA score of B and 15% had ASIA score of A.

Table 4: Distribution of follow up ASIA score of study subjects

Follow up ASIA score	After 2 weeks	After 3 months	After 6 months	After 9 months	After 12 months
A	14 (14%)	8 (8%)	9 (9%)	8 (8%)	12 (12%)
B	8 (8%)	5 (5%)	5 (5%)	6 (6%)	-
C	16 (16%)	6 (6%)	4 (4%)	4 (4%)	28 (28%)
D	12 (12%)	15 (15%)	16 (16%)	20 (20%)	-
E	50 (50%)	68 (68%)	66 (66%)	60 (60%)	15 (60%)

Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%.

Discussion

Spinal cord injury is an insult spinal cord resulting in a change either temporary or permanent, in its normal motor, sensory, or autonomic function. Traumatic Spinal Cord Injury (TSCI) is a devastating neurological injury, causing paralysis, sensory loss and sphincter disorder in different degrees and indirectly imposes a significant burden on the health care system. [18] Internationally incident rates for traumatic spinal cord injuries range from 10.4-83 cases per million of population with significant differences between different countries or regions. [19] The incidence of traumatic spinal cord injury (TSCI) in the developing countries is 25.5/million/year. [20] People with Spinal cord injury are 2 to 5 times to die prematurely than people without Spinal cord injuries depending on the health-care system capacity. [21] Etiologically, more than 90% of spinal cord injuries cases are traumatic and caused by incidences such as road traffic accidents, violence, sports or falls. [20] Spinal cord injury is a two-step process that involves Primary (combination of the initial impact as well as the subsequent persisting compression) and Secondary injury (series of physiological and biochemical changes after which are primary mechanical injury). [22]

Out of 100 patients, most of the patients were in the age group 51-60 (32%) and 41-50 (30%). Mean age was 51.59 years. Majority of the patients were male 70% while 30% patients were female. In the series of Chamberlain JD et al [23] out of 932 patients, male to female ratio was 1.88:1. The mean age in tetraplegics was 53.5 years and in paraplegics was 43.8 years. Over all mean age was 48 years. Johansson et al [24] out of 346 patients, 72.3% were males and 27.7% were females. Majority of the patients were male 75% while 25% patients were female. In present study, majority of traumatic spine injuries were due to road traffic accidents (52%), followed by fall from height (45%) and assault (3%). Majority of spine fractures occurred at cervical (40%) followed by Lumbar (30%) followed by thoracic (20%) vertebral level. Out of 100 patients, 55 patients (55%) had no associated injuries. Common associated injuries were hemoperitoneum (12%), head injury (11%), fracture humerus (9%) and fracture clavicle (6%). Ahuja et al [25] in a study of 313 patients, 182 patients were operated early and underwent surgery within 24 hours and 131 patients were operated after 24 hours. The primary end point was change in American Spinal Injury Impairment Scale (AIS) at the end of 6 months. The group who underwent surgery under 24 hours, 19.8% demonstrated a 2 or more grade improvement in AIS at 6 months, whereas 8.8% of patients show same improvement who had undergone surgery after 24 hours.

Sommer et al [26] reported epidemiology, treatment, clinical and radiological results of 283 patients with spine fractures in a five-year period. The operation rate ranged from 42% of cervical to 9% of thoracic and 24% of the lumbar spine. He found good radiological results concerning the correction of the wedge compression and the collapse of the lumbar vertebral body by fixation with an internal fixator. After a follow-up of 2-5 years, nearly 80% of conservatively, as well as surgically, treated patients had residual back pain. Shamim MS et al [27] in series of 54 patients with complete SCI, in which 50% received surgical treatment, they found the operated group spent a longer period in rehabilitation. They also had a longer hospital stay, were associated with more complications, especially those related to infections (and also had a significantly higher cost of treatment when compared with the group treated conservatively. Pandey Vk et al [28] concluded in his study with 23-month average follow-up revealed that 17% of patients who underwent surgery for spine fractures died, all after discharge

Out of 100 patients, 54% patients had no Neurodeficit and 48=6% patients had Neurodeficit. On pre -operative assessment 50% patients had ASIA score of E, 11% had ASIA score of D, 17% had ASIA score of C, 7% had ASIA score of B and 15% had ASIA score of A. Follow up ASIA score after 2 weeks in patients was A in 14% patients, B in 8%, C in 16%, D in 12, E in 50%. Follow up ASIA score after 3 months in patients was A in 8% patients, B in 5%, C in 6%, D in 15%, E in 68%. Follow up ASIA score after 6 months in patients was A in 9% patients, B in 5%, C in 4%, D in 16%, E in 66%. Follow up ASIA score after 9 months in patients was A in 8% patients, B in 6%, C in 4%, D in 20, E in 60%. Follow up ASIA score after 12 months in patients was A in 12%, D in 28, E in 60%. In a study, 70% of patients initially diagnosed as ASIA A didn't convert, as did 90% with ASIA D. On the whole 68% of total patients didn't convert, while 30% of patients improved and 2% deteriorated. [29] Middendrop et al [30] in his series of 273 patients observed that ASIA A were 161, ASIA B were 37, ASIA C were 43, and ASIA D were 32. 42(26%) converted from ASIA A, 27(73%) from ASIA B, 32(75%) from ASIA C, 5(16%) from ASIA D.

Conclusion

Complication rates were higher in patients treated non-operatively. Leading causes in deaths at cervical level were due to respiratory failure and leading causes of deaths in thoracic and lumbar vertebral level were due to secondary complications of long-standing bed sores. Despite limited sources, outcomes of SCI patients in India appear favourable with evidence of clinical improvement and low mortality. In-country like India Road traffic accident in young population is the most common cause of SCI. Adequate traffic education and public awareness, in implementing traffic rules and road safety measures may reduce RTAs. Establishment of physical rehabilitation programs is needed to maximize functional outcomes and minimize secondary complications, and efforts should be made to improve the follow-up of SCI patients.

References

1. Divanoglou A, Westgren N, Bjelak S, Levi R. Medical conditions and outcomes at 1 year after acute traumatic spinal cord injury in a Greek and a Swedish region: a prospective, population-based study. Spinal Cord. 2010 Jun;48(6):470-6.
2. Joseph C, Nilsson Wikmar L. Prevalence of secondary medical complications and risk factors for pressure ulcers after traumatic spinal cord injury during acute care in South Africa. Spinal Cord. 2016 Jul;54(7):535-9.
3. Azarhomayoun A, Aghasi M, Mousavi N, Shokraneh F, Vaccaro AR, Mirzaian AH, Derakhshan P, Rahimi-Movaghar V. Mortality rate and predicting factors of traumatic thoracolumbar spinal cord injury; a systematic review and meta-analysis. Bulletin of Emergency & Trauma. 2018 Jul;6(3):181.
4. Kumar R, Lim J, Mekary RA, Rattani A, Dewan MC, Sharif SY, Osorio-Fonseca E, Park KB. Traumatic spinal injury: global epidemiology and worldwide volume. World neurosurgery. 2018 May 1;113:e345-63.
5. Dahlberg A, Kotila M, Kautiainen H, Alaranta H. Functional independence in persons with spinal cord injury in Helsinki. Journal of rehabilitation medicine. 2003 Sep 1;35(5):217-20.
6. World Health Organization, International Spinal Cord Society. International perspectives on spinal cord injury. World Health Organization; 2013.
7. Adriaansen JJ, Ruijs LE, van Koppenhagen CF, van Asbeck FW, Snoek GJ, van Kuppevelt D, Visser-Meily JM, Post MW. Secondary health conditions and quality of life in persons living with spinal cord injury for at least ten years. Journal of rehabilitation medicine. 2016 Nov 11;48(10):853-60.
8. Lim SW, Shiue YL, Ho CH, Yu SC, Kao PH, Wang JJ, Kuo JR. Anxiety and depression in patients with traumatic spinal cord injury: a nationwide population-based cohort study. PloS one. 2017 Jan 12;12(1):e0169623.
9. Pickelsimer E, Shiroma EJ, Wilson DA. Statewide investigation of medically attended adverse health conditions of persons with spinal cord injury. The journal of spinal cord medicine. 2010 Jan 1;33(3):221-31.
10. Swain A, Grundy D, Russel J. ABC of the Spinal Cord Injury: Articles Published in the BMJ. BMJ publication: London, 1991: 1–3. PMC1339459.
11. Obalum DC, Giwa SO, Adekoya-Cole TO, Enweluzo GO. Profile of spinal injuries in Lagos, Nigeria. Spinal Cord. 2009 Feb;47(2) :134-7.
12. Wang H, Xiang Q, Li C, Zhou Y. Epidemiology of traumatic cervical spinal fractures and risk factors for traumatic cervical spinal cord injury in China. Clinical Spine Surgery. 2013 Dec 1;26(8):E306-13.
13. Desmoulin GT, Pradhan V, Milner TE. Mechanical aspects of intervertebral disc injury and implications on biomechanics. Spine. 2020 Apr 15;45(8):E457-64.
14. Leucht P, Fischer K, Muhr G, Mueller EJ. Epidemiology of traumatic spine fractures. Injury. 2009 Feb 1;40(2):166-72.
15. Pirouzmand F. Epidemiological trends of spine and spinal cord injuries in the largest Canadian adult trauma center from 1986 to 2006. Journal of neurosurgery: Spine. 2010 Feb 1;12(2):131-40.
16. Ren C, Qin R, Wang P, Wang P. Comparison of anterior and posterior approaches for treatment of traumatic cervical dislocation combined with spinal cord injury: minimum 10-year follow-up. Scientific Reports. 2020 Jun 25;10(1):10346.
17. Rasoulinejad P, McLachlin SD, Bailey SI, Gurr KR, Bailey CS, Dunning CE. The importance of the posterior osteoligamentous complex to subaxial cervical spine stability in relation to a unilateral facet injury. The Spine Journal. 2012 Jul 1;12(7):590-5.
18. Stahel PF, VanderHeiden T, Finn MA. Management strategies for acute spinal cord injury: current options and future perspectives. Current opinion in critical care. 2012 Dec 1;18(6):651-60.
19. Nadeau M, McLachlin SD, Bailey SI, Gurr KR, Dunning CE, Bailey CS. A biomechanical assessment of soft-tissue damage in the cervical spine following a unilateral facet injury. JBJS. 2012 Nov 7;94(21):e156.
20. Rahimi-Movaghar V, Sayyah MK, Akbari H, Khorramirouz R, Rasouli MR, Moradi-Lakeh M, Shokraneh F, Vaccaro AR. Epidemiology of traumatic spinal cord injury in developing

countries: a systematic review. Neuroepidemiology. 2013 Jun 13;41(2):65-85.
21. Chhabra HS, Arora M. Demographic profile of traumatic spinal cord injuries admitted at Indian Spinal Injuries Centre with special emphasis on mode of injury: a retrospective study. Spinal Cord. 2012 Oct;50(10):745-54.
22. Chen Y, Tang Y, Vogel L, DeVivo M. Causes of spinal cord injury. Topics in spinal cord injury rehabilitation. 2013 Jan 1;19(1):1-8.
23. Chamberlain JD, Deriaz O, Hund-Georgiadis M, Meier S, Scheel-Sailer A, Schubert M, Stucki G, Brinkhof MW. Epidemiology and contemporary risk profile of traumatic spinal cord injury in Switzerland. Injury epidemiology. 2015 Dec;2(1):1-1.
24. Johansson E, Luoto TM, Vainionpää A, Kauppila AM, Kallinen M, Väärälä E, Koskinen E. Epidemiology of traumatic spinal cord injury in Finland. Spinal Cord. 2021 Jul; 59(7):761-768.
25. Ahuja CS, Badhiwala JH, Fehlings MG. "Time is spine": the importance of early intervention for traumatic spinal cord injury. Spinal Cord. 2020 Sep;58(9):1037-1039.
26. Sommer C, Bereiter H. Epidemiology, treatment and long-term results of spinal fractures at a non-university affiliated central hospital with special reference to fractures of the lumbar spine. Helvetica Chirurgica Acta. 1994 Apr 1;60(4):539-45.
27. Shamim MS, Ali SF, Enam SA. Non-operative management is superior to surgical stabilization in spine injury patients with complete neurological deficits: A perspective study from a developing world country, Pakistan. Surgical Neurology International. 2011;2.
28. Pandey VK, Nigam V, Goyal TD, Chhabra HS. Care of post-traumatic spinal cord injury patients in India: an analysis. Indian journal of orthopaedics. 2007 Oct;41(4):295.
29. Jaglal SB, Munce SE, Guilcher SJ et al. Health system factors associated with rehospitalisation after traumatic spinal cord injury: a population-based study Spinal Cord 2009;47(8):604-09.
30. Van-Middendorp JJ, Hosman AJF, Pouw MH et al. ASIA impairment scale conversion in traumatic SCI: is it related with the ability to walk? A descriptive comparison with functional ambulation outcome measures in 273 patients. Spinal Cord 2009;47(7):555- 60.